JC14 Rec'd PCT/PTO 19 SEP 2001

FORM PTO-1390 (REV. 11-2000) — U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
0933-0171P	
U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	
09/936865	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FI00/00375	April 28, 2000	April 30, 1999

TITLE OF INVENTION
METHOD FOR THE DETERMINATINON OF DISACCHARIDASES AND KIT THEREFOR

APPLICANT(S) FOR DO/EO/US
SIPPONEN, Pentti; SUOVANIENI, Osmo; TAMMINEN, Jani

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau). WO 00/66765
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is transmitted herewith.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449(s), and International Search Report (PCT/ISA/210) with 6 cited document(s).
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
    1.) Zero (0) Sheets of Formal Drawings
    2.) International Preliminary Examination Report (PCT/IPEA/409)
    3.) PCT Request (PCT/RO/101)

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/936865	PCT/FI00/00375	0933-0171P

21. ☒ The following fees are submitted:		CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1,000.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$860.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$690.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =		$ 1,000.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		$ 130.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	11 - 20 =	0	X **$18.00**	$ 0.00	
Independent Claims	1 - 3 =	0	X **$80.00**	$ 0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		NONE	+ **$270.00**	$ 0.00	
			TOTAL OF ABOVE CALCULATIONS =	$ 1,130.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				$ 0.00	
			SUBTOTAL =	$ 1,130.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐20 ☐30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$ 0.00	
			TOTAL NATIONAL FEE =	$ 1,130.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property			+	$ 0.00	
			TOTAL FEES ENCLOSED =	$ 1,130.00	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of $ **1,130.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account. No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-2448.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:
Birch, Stewart, Kolasch & Birch, LLP or Customer No. 2292
P.O. Box 747
Falls Church, VA 22040-0747
(703)205-8000

Date: September 19, 2001

By_____
Gerald M. Murphy, Jr., #28,977

/rem

PATENT
0933-0171P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant:	SIPPONEN, Pentti et al.	Conf.:	
Int'l. Appl. No.:	PCT/FI00/00375		
Appl. No.:	NEW	Group:	
Filed:	September 19, 2001	Examiner:	
For:	METHOD FOR THE DETERMINATINON OF DISACCHARIDASES AND KIT THEREFOR		

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

September 19, 2001

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/FI00/00375 which has an International filing date of April 28, 2000, which designated the United States of America and was published in English.--

Docket No. 0933-0171P

REMARKS

The specification has been amended to provide a cross-reference to the previously filed International Application.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
Gerald M. Murphy, Jr., #28,977

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

GMM/rem
0933-0171P

METHOD FOR THE DETERMINATION OF DISACCHARIDASES AND KIT THEREFOR

The present invention relates to a method for the determination of disaccharidases in a biopsy sample from the duodenum, usually in connection with a gastroscopic procedure, of a patient suspected of suffering from a condition of disaccharide intolerance, especially lactose intolerance. The invention also relates to a kit for use in the diagnosis of said intolerance. The present method can easily be carried out as a rapid "bed-side" diagnostic method.

Background of the invention

Disaccharide intolerance is defined as the limited ability of the organism to digest disaccharides, typically milk sugar, i.e. lactose, but also e.g. maltose intolerance is known. The intolerance is due to a decrease in the activity or the concentration of the corresponding disaccharide digesting enzyme, i.e. of lactase (β-galactosidase) in the case of lactose intolerance, which enzyme is produced in the mucous membrane of the small intestine, or duodenum. The enzyme breaks down the disaccharide to simpler sugars that can then be absorbed into the bloodstream.

Normally, when lactose reaches the digestive system, the lactase enzyme hydrolyzes it to D-glucose and D-galactose. The liver then converts the galactose into glucose, which enters the bloodstream and raises the person's blood glucose level. If lactose is incompletely broken down, the blood glucose level does not rise, and a diagnosis of lactose intolerance is confirmed. The resulting condition, although not usually dangerous, may be very distressing. While not all persons deficient in lactase have symptoms, those who do are considered to be lactose intolerant. See generally Buller, H.A. and Grand, R.J., "Lactose Intolerance," Ann. Rev. Med.. Vol. 41, pp. 141-148 (1990).

Common symptoms include nausea, cramps, bloating, gas, and diarrhea, which begin about 30 minutes to 2 hours after eating or drinking foods containing lactose. The symptoms are due to the unabsorbed lactose which in the small testine

binds liquid and speeds up the through-put rate to the large intestine, where the bacteria digest the carbohydrates to short chain fatty acids, lactate, carbon dioxide and hydrogen.The severity of the symptoms varies depending on the amount of lactose each individual can tolerate.

Some causes of lactose intolerance are well known. For instance, certain digestive diseases and injuries to the small intestine can reduce the amount of enzymes produced. In rare cases, children are born without the ability to produce lactase. For most people, though, lactase deficiency is a condition that develops naturally over time. After about the age of two years, the body begins to produce less lactase. However, many people may not experience symptoms until they are much older.

Between 30 and 50 million Americans are lactose intolerant. Certain ethnic and racial populations are more widely affected than others. As many as 75 percent of all African-Americans and Native Americans and 90 percent of Asian-Americans are lactose intolerant. In the southern Europe and the Middle East the percentage is about 60, and among arabs as high as 90. The condition is least common among persons of northern European descent, e.g. in Finland 11 % of the population are lactose intolerant, but in the northern Scandinavia, 60 % of the Lapps are lactose intolerant.

Lactose intolerance is conventionally diagnosed using a lactose tolerance test, a hydrogen breath test, a stool acidity test or galactose determination.

The lactose tolerance test is the most common test used for diagnosing lactose intolerance. A blood sample after fasting is taken from the patient for glucose determination, whereafter the patient is given a lactose drink. New blood samples are taken after 20, 40 and 60 minutes. The test shows hypolactasia if clear stomach symptoms develop after 1 to 2 hours after taking the lactose drink and if the increase in the blood glucose level remains below 1.1 mmol/l from the initial value.

The hydrogen breath test measures the amount of hydrogen in the breath. Normally, no hydrogen is detectable in the breath. However, undigested lactose is fermented in the colon by bacteria, a result of which is the formation of many gases, including hydrogen. The hydrogen formed is absorbed from the intestine and carried by the blood stream to the lungs, and exhaled. The patient is given a lactose containing drink, after which the breath is analyzed at regular intervals. Increased hydrogen concentrations in the breath means improper digestion of lactose. The test can be affected by certain foods, medication and smoking.

The stool acidicity test measures lactic acid and other short chain fatty acids produced by colon bacteria by fermenting undigested lactose, which acids can be determined in the stool sample. Galactose can in a simple test be determined in the urine after administration of lactose, the test requiring a semi-quantitative determination method for galactose.

Methods for the determination of disaccharides are previously known, but analysis of the disaccharidase content of a biopsy sample usually requires several steps. First of all, the sample must be homogenized, after which it is incubated with a substrate (lactose, maltose etc.), and then the desired monosaccharide is analysed chemically. The existing methodology is complex and time-consuming. Therefore, there is a need for a single, rapid and specific method of diagnosing disaccharide intolerance, especially lactose intolerance.

The publication EP 72 450 discloses a lactase activity test for infants in conjunction with diagnosing infants for cystic fibrosis (CF), such CF-infants reportedly having increased disaccharidase activities in the meconium. Accordingly, a thin film of a meconium sample is spread on a test device containing lactose, glucose oxidase, a peroxidatively active agent and a chromogen, and if the sample has lactase activity, an easily visible blue colour develops directly beneath the meconium.

Summary of the invention

The present invention provides a quick and easy method for the determination of disaccharidase enzyme in a biopsy sample taken from the duodenum of an individual suspected of being disaccharide intolerant, which method comprises the steps of

- contacting the said biopsy sample as such with a substrate medium containing the said disaccharide; and
- determining the presence of a desired monosaccharide in the substrate medium by using an assay system for said monosaccharide.

It is a further object of this invention to provide a kit for use in carrying out the above mentioned method comprising

- a substrate medium containing the said disaccharide for contacting with a biopsy sample taken from the duodenum of an individual suspected of being disaccharide intolerant; and
- means for the determination of the presence of a desired monosaccharide in the substrate medium after exposure of the substrate medium to the said biopsy sample.

Further areas of applicability of the present invention will be apparent from the detailed description given hereinafter.

Detailed description of the invention

According to the present invention, disaccharide intolerance is diagnosed in an individual by detecting a deficiency or reduced activity of the corresponding disaccharide digesting enzyme, disaccharidase, in a biopsy sample taken from the duodenum of the individual where the corresponding enzyme is normally produced.

Although reference is made specifically to lactose as the disaccharide and lactase as the corresponding disaccharide digesting enzyme, it is clear that the description

equally well applies to methods for diagnosing also other disaccharide intolerance conditions. Such conditions include maltose intolerance, in which case a deficiency of maltase enzyme will be the object of diagnosis, or saccharose intolerance, in which case the enzyme to be diagnosed is saccharidase.

In short, the method comprises detecting the presence of disaccharidase in a biopsy sample taken from the duodenum of an individual suspected of suffering from a condition of disaccharide intolerance, which method comprises a first step of contacting the biopsy sample as such, in intact form, that is in an unprocessed, such as in an unhomogenized and uncomminuted form, with a substrate medium containing the said disaccharide. Any disaccharidase present in the sample digests the disaccharide in the substrate to monosaccharides. In a subsequent step, the presence of a desired monosaccharide so formed in the substrate medium is determined by using an assay system for said monosaccharide.

When the object of diagnosis is lactose intolerance, and the method thus comprises detecting the possible presence or absence of lactase enzyme activity in the biopsy sample, the disaccharide to be used in the substrate medium is lactose. Lactose is digested by any lactase present in the biopsy sample to glucose and galactose, which can be detected in the substrate medium in a known manner.

Maltose, on the other hand, will be digested by the maltase enzyme to two glucose molecules, and saccharose is digested by saccharidase to glucose and fructose.

The method can be carried out in a simple manner, for example by using a substrate medium which in the same solution contains the substrate for the enzyme, that is lactose, if a lactase enzyme deficiency is to be diagnosed, glucose oxidase (or galactose oxidase) enzyme, a peroxidase enzyme and a chromogenic substance. It is also possible to keep one or more of the reagents separate from the other reagents up until the moment of carrying out the test. One such alternative is to keep the chromogenic substance, and/or the glucose or galactose enzyme, in a separate solution, or for example absorbed onto a suitable medium, for example a gel

matrix, or paper, to be contacted with the remaining reagents at the moment of testing. Other modifications of carrying out the test are also possible, and easily construed by a person skilled in the art.

The disaccharidase enzyme in the biopsy sample introduced into the substrate medium will digest the disaccharide in the substrate medium to glucose, galactose and/or fructose, depending on the type of disaccharide. The glucose (or galactose) oxidase enzyme in the same medium, which preferably is buffered to approximately pH 5-7, then oxidizes the glucose or galactose to oxidation products, liberating hydrogen peroxide (H_2O_2). The peroxidase enzyme catalyzes a reaction where the hydrogen peroxide oxidizes the colourless chromogenic substance to form a coloured or otherwise detectable form.

The colour reaction taking place in the substrate is rapid and detectable at room temperature already after a few minutes. The biopsy sample can be a small, e.g. of the order of 1 mm x 1 mm x 1 mm, taken from the duodenum in connection with a gastroscopic procedure. The sample taken is used as such and there is no need to homogenize or otherwise comminute the sample prior to testing. The colour change can be determined either with the bare eye, or can be read with a suitable apparatus e.g. photometrically, fluorometrically or reflectometrically. The method makes it possible to evaluate also the disaccharidase level in the biopsy sample, i.e. to make a semiquantitative analysis, and thus to evaluate the severity of the intolerance condition. The method is easy and rapid to carry out as a 'bedside test' and requires no complicated laboratory equipment.

The concentrations of the various reagents in the substrate medium are not critical and can be adjusted to provide for optimal testing conditions. The reaction can be carried out in a suitable vessel at room temperature, or it can be provided in a suitable kit-form, the kit containing all the reagents needed for carrying out the test in a single ready-to-use package.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Claims

1. Method for the determination of a disaccharidase enzyme, which is able to digest a disaccharide into monosaccharides, in a biopsy sample taken from the duodenum of an individual to be tested for disaccharide intolerance, which method comprises the steps of
- contacting the said biopsy sample as such with a substrate medium containing the said disaccharide; and
- determining the presence of a desired monosaccharide in the substrate medium by using an assay system for said monosaccharide.

2. The method according to claim 1, wherein the disaccharidase to be determined in the sample is lactase, maltase, or sucrase.

3. The method according to claim 1, wherein the disaccharide is lactose.

4. The method according to claim 3, wherein the monosaccharide to be determined in the substrate medium is glucose.

5. The method according to claim 1, wherein the substrate medium contains disaccharide, glucose and/or galactose oxidase, a peroxidase enzyme and a chromogenic substance.

6. The method according to claim 4, wherein the glucose assay system is a reagent strip, preferably a dip-and-read reagent strip.

7. The method according to claim 1, wherein the assay system for determining the monosaccharide is photometric, fluorometric or reflectometric.

8. Kit for use in carrying out the method according to claim 1, comprising
- a substrate medium containing the said disaccharide for contacting with the biopsy sample; and

- means for determining the presence of a desired monosaccharide in the substrate medium after exposure of the substrate medium to the biopsy sample.

9. The kit according to claim 8, wherein the substrate contains a glucose or galactose enzyme, and a peroxidase enzyme.

10. The kit according to claim 9, wherein the means for the determination of the presence of glucose in the substrate medium comprises a chromogenic substance.

11. The kit according to claim 10, wherein the chromogenic substance is kept separate from the other components of the substrate.

#3

BIRCH, STEWART, KOLASCH & BIRCH, LLP

P.O. Box 747 • Falls Church, Virginia 22040-0747
Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

ATTORNEY DOCKET NO.
0933-0171P

PLEASE NOTE: YOU MUST COMPLETE THE FOLLOWING:

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert Title: → METHOD FOR THE DETERMINATION OF DISACCHARIDASES AND KIT THEREFOR

the specification of which is attached hereto. If not attached hereto,

Fill in Appropriate Information — For Use Without Specification Attached: →

the specification was filed on _____ as
United States Application Number _____ ;
and amended on _____ (if applicable); and/or
the specification was filed on April 28, 2000 as PCT
International Application Number PCT/FI00/00375 ; and was
amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Insert Priority Information: (if appropriate) →

Prior Foreign Application(s) (Number)	(Country)	(Month / Day / Year Filed)	Priority Claimed	
990990	Finland	4/30/1999	☒ Yes	☐ No
			☐ Yes	☐ No
			☐ Yes	☐ No
			☐ Yes	☐ No

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

Insert Provisional Application(s): (if any) →

(Application Number)	(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More than 12 Months (6 Months for Designs) Prior to the Filing Date of This Application:

Insert Requested Information: (if appropriate) →

Country	Application Number	Date of Filing (Month / Day / Year)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States and/or PCT application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States and/or PCT application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Insert Prior U.S. Application(s): (if any) →

(Application Number)	(Filing Date)	(Status — patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

Raymond C. Stewart	(Reg. No. 21,066)	Terrell C. Birch	(Reg. No. 19,382)
Joseph A. Kolasch	(Reg. No. 22,463)	James M. Slattery	(Reg. No. 28,380)
Bernard L. Sweeney	(Reg. No. 24,448)	Michael K Mutter	(Reg. No. 29,680)
Charles Gorenstein	(Reg. No. 29,271)	Gerald M. Murphy, Jr.	(Reg. No. 28,977)
Leonard R. Svensson	(Reg. No. 30,330)	Terry L. Clark	(Reg. No. 32,644)
Andrew D. Meikle	(Reg. No. 32,868)	Marc S. Weiner	(Reg. No. 32,181)
Joe McKinney Muncy	(Reg. No. 32,334)	John A. Castellano	(Reg. No. 35,094)
Donald J. Daley	(Reg. No. 34,313)	John W. Bailey	(Reg. No. 32,881)

Send Correspondence to:
BIRCH, STEWART, KOLASCH & BIRCH, LLP or Customer No. 2292
P.O. Box 747 • Falls Church, Virginia 22040-0747
Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

PLEASE NOTE: YOU MUST COMPLETE THE FOLLOWING:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First or Sole Inventor: 1-00
Insert Name of Inventor →
Insert Date This Document is Signed
Insert Residence →
Insert Citizenship →
Insert Post Office Address →

GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Pentti	SIPPONEN		Sept. 20, 2001

Residence (City, State & Country): Espoo, Finland
CITIZENSHIP: Finnish
POST OFFICE ADDRESS (Complete Street Address including City, State & Country): Käärmesaarentie 4 A, FIN-02160 ESPOO, FINLAND FIX

Full Name of Second Inventor, if any: see above 2-00

GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Osmo	SUOVANIEMI		Sept. 20, 2001

Residence (City, State & Country): Helsinki, Finland FIX
CITIZENSHIP: Finnish
POST OFFICE ADDRESS (Complete Street Address including City, State & Country): Kulopolku 6, FIN-00570 HELSINKI, FINLAND

Full Name of Third Inventor, if any: see above 3-00

GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Jani	TAMMINEN		Sept. 20, 2001

Residence (City, State & Country): Helsinki, Finland FIX
CITIZENSHIP: Finnish
POST OFFICE ADDRESS (Complete Street Address including City, State & Country): Ormusmäentie 8 C 45, FIN-00700 HELSINKI, FINLAND

Full Name of Fourth Inventor, if any: see above

GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*

Residence (City, State & Country):
CITIZENSHIP:
POST OFFICE ADDRESS (Complete Street Address including City, State & Country):

Full Name of Fifth Inventor, if any: see above

GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*

Residence (City, State & Country):
CITIZENSHIP:
POST OFFICE ADDRESS (Complete Street Address including City, State & Country):

* DATE OF SIGNATURE